Drive Device

Claims

1. Drive device (1) for the adjustment of an actuating element (2) of a throttle, valve, connection device, dosage feed device or similar device, in particular in the mining of mineral oil or natural gas with at least one spindle drive (3) movably connected to the actuating element (2) and a gear unit arranged between the spindle drive and at least one motor (4, 5),
characterised in that
the gear unit exhibits a reduction gear (7) assigned to the spindle drive (3), in particular a so-called harmonic drive gear, and a spur gear (9) assigned to the motor (4, 5) and in particular self-locking.

2. Drive device according to Claim 1,
characterised in that
the spindle drive (3) is a recirculating roller or ball spindle drive with a spindle nut (10) and threaded spindle (11).

3. Drive device according to Claim 1 or 2,
characterised in that
the spindle nut (10) is supported rotationally, but axially immovably in a device housing (42).

4. Drive device according to one of the previous Claims,
characterised in that
the spindle nut (10) is supported rotationally rigidly, but axially movably in a device housing (42).

5. Drive device according to one of the previous Claims,
characterised in that
the spindle nut (10) or threaded spindle (11) is rotationally rigidly connected to the reduction gear (7).

6. Drive device according to one of the previous Claims,
characterised in that
the reduction gear (7) exhibits as a harmonic drive gear a flexible, cup-shaped toothed sleeve (12), a fixed ring element (13) and a wave generator (14), whereby the toothed sleeve (12) partially engages the inner teeth of the ring element (13) with its outer teeth and the wave generator (14) is arranged inside the toothed sleeve.

7. Drive device according to one of the previous Claims,
characterised in that
the toothed sleeve (12) is rotationally rigidly connected to the spindle nut (10) or the threaded spindle (11).

8. Drive device according to one of the previous Claims,
characterised in that
a rotationally supported, but axially immovable connecting sleeve (15) is arranged between the toothed sleeve (12) and the spindle drive (6).

9. Drive device according to one of the previous Claims,
characterised in that
the threaded spindle (11) is rotationally rigidly inserted with its drive end (16) into a retention hole (17) of the connecting sleeve (15).

10. Drive device according to one of the previous Claims,
characterised in that
splines (19) are formed between the threaded spindle (11) and the inner side (18) of the retention hole (17).

11. Drive device according to one of the previous Claims,
characterised in that
the spur gear (9) is helically toothed.

12. Drive device according to one of the previous Claims,
characterised in that
the spur gear (9) is formed as a double helical gear (23).

13. Drive device according to one of the previous Claims,

characterised in that
the reduction gear (7) and in particular its wave generator (14) are movably connected to a first spiral toothed gear wheel (20) and the motor (4, 5) to a second spiral toothed gear wheel (21) of the spur gear (9).

14. Drive device according to one of the previous Claims,
characterised in that
the second spiral toothed gear wheel (21) is arranged on a drive shaft (22) of the motor (4, 5).

15. Drive device according to one of the previous Claims,
characterised in that
two or more motors (4, 5) are assigned to the drive shaft (22).

16. Drive device according to one of the previous Claims,
characterised in that
two or more drive shafts (22) each with at least one motor (4, 5) are essentially supported in parallel to the threaded spindle (11) in the device housing (42).

17. Drive device according to one of the previous Claims,
characterised in that
a second spiral toothed gear wheel (21), which engages the first spiral toothed gear wheel (20), is arranged on each drive shaft (22).

18. Drive device according to one of the previous Claims,
characterised in that
each motor (4, 5) is an electric motor.

19. Drive device according to one of the previous Claims,
characterised in that
a helix angle (25) of the helical tooth arrangement (24) of the first and / or second spiral toothed gear wheel (20, 21) lies in the range from 50° to about 90° and in particular in the range from 65° to 85°.

20. Drive device according to one of the previous Claims,
characterised in that

the transmission ratio of the spur gear (9) is between i=25 and i<1.

21. Drive device according to one of the previous Claims,
characterised in that
the first and second spiral toothed gear wheel (20, 21) exhibit 1 to 10, preferably 1 to 7 and especially preferred 1 to 4 teeth.

22. Drive device according to one of the previous Claims,
characterised in that
the connecting sleeve (15) is releasably connected at its end (26) facing away from the spindle drive (3) to the toothed sleeve (12).

23. Drive device according to one of the previous Claims,
characterised in that
at least one engaging element (27) protrudes essentially radially outwards from the threaded spindle (11) or the spindle nut (10) and engages slots (28, 29) of a fixed sleeve (30) and a rotating sleeve (31), whereby a first slot (28) extends essentially in the axial direction (38) and a second slot (29) extends at an acute angle to the first slot (28).

24. Drive device according to one of the previous Claims,
characterised in that
the actuating element (2) can be rotated together with the rotating sleeve (31).

25. Drive device according to one of the previous Claims,
characterised in that
a position sensor (32) is assigned to the axially movable part (10, 11) of the spindle drive (3).

26. Drive device according to one of the previous Claims,
characterised in that
a position sensor (32) is assigned to the rotating part (10, 11) of the spindle drive (3).

27. Drive device according to one of the previous Claims,
characterised in that

the position sensor (32) exhibits an essentially flat code carrier (33), which is offset radially outwards with respect to the threaded spindle (11) and arranged parallel to it.

28. Drive device according to one of the previous Claims,
characterised in that
a dog (34) is arranged between the axially movable part (10, 11) of the spindle drive (3), in particular between its engaging element (27) and the code carrier (33).

29. Drive device according to one of the previous Claims,
characterised in that
a distance sleeve (35) is arranged in a motor hole (36) of the device housing (42) on a side, facing away from the spiral toothed gear wheel (21), of the at least one motor (4, 5).

30. Drive device according to one of the previous Claims,
characterised in that
the device housing (42) is of modular construction.

31. Drive device according to one of the previous Claims,
characterised in that
the code carrier (33) is guided in the axial direction (38) in a guide sleeve (37).

32. Drive device according to one of the previous Claims,
characterised in that
the threaded spindle (11) and the spindle nut (10) are supported together rotationally in the device housing (42).

33. Drive device according to one of the previous Claims,
characterised in that
the threaded spindle (11) is releasably connected at its end (39) facing away from the spindle nut (10) to a sliding rod (40) of the actuating element (2).

34. Drive device according to one of the previous Claims,
characterised in that

the code carrier (33) of the position sensor (32) is inserted at least with one end section in an internal hole (41) of the threaded spindle (11) and is releasably attached there for common movement of the code carrier and threaded spindle in the axial direction (38).

35. Drive device according to one of the previous Claims,
characterised in that
the spindle nut (10) and the connecting sleeve (15) are releasably connected to one another.